ANDROLOGY

Original Article

Prevalence of erectile dysfunction in men over 40 years of age in Turkey: Results from the Turkish Society of Andrology Male Sexual Health Study Group

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ABSTRACT

Objective: Previous study conducted by the Turkish Society of Andrology in 1999 reported the prevalence of erectile dysfunction (ED) as 69.2% in men of ≥40 years of age, using a single-item non-validated question. This rate seemed to be higher compared to the studies reported worldwide. So, there was a need to carry out another epidemiological study by using validated questionnaires. Our aim was to investigate ED prevalence, severity, and its correlates in men aged ≥40 years using validated tools.

Material and methods: This cross-sectional, observational, population-based field survey was carried out in randomly selected males of ≥40 years from 19 provinces of Turkey. All participant completed a survey included with socio-demographic and socio-economic characteristics, medical and sexual history, associated physical and medical comorbidities. Erectile function was assessed by the International Index of Erectile Function (IIEF) questionnaire based on a total score of 30. The prevalence of ED, its severity and correlates in men aged ≥40 years were determined for main outcome measures. Data sets were statistically compared and p<0.05 was considered as significant.

Results: Median age of 2.760 males was 54.2 years. The median prevalence of ED was calculated as 33% among all males of ≥40 years of age. When subjects were stratified by age; median ED prevalence rates were 17% for 40–49 years, 35.5% for 50–59 years, 68.8% for 60–69 years, and 82.9% for ≥70 years. Among all ED men, 76.9% reported mild, 16.3% moderate, and 5.7% severe ED. At logistic regression analyses; age, diabetes, hypertension, atherosclerosis, dyslipidemia, lower urinary tract symptoms, educational status and monthly income were found to be independent risk factors for having ED.

Conclusion: This population-based survey in Turkish men of ≥40 years of age reported the prevalence of ED as 33%. Besides, this study reported age as the main predictor for presence and severity of ED.

Keywords: Comorbidities; diagnosis; ejaculatory disorders; epidemiology; erectile dysfunction; lower urinary tract symptoms; prevalence; risk factors; sexual dysfunction; vascular risk factors.

Introduction

Erectile dysfunction (ED) is defined as the inability to attain and/or maintain penile erection sufficient for satisfactory sexual intercourse.[1] ED is a common disorder associated with aging that significantly impacts quality of life of men and their partners. ED has traditionally been classified as psychogenic, organic, or mixed type. Recent data show that approximately more than 90% of men aged over 40 years with ED

have an organic cause, with vascular diseases being the most common etiology.[2] Although ED is a natural consequence of aging, its severity is directly related to vascular risk factors, such as high blood pressure, atherosclerosis, coronary artery disease, smoking, dyslipidemia, and diabetes mellitus, all of which are associated with endothelial dysfunction.[3]

As the penis has been recently considered as the barometer of the body's endothelial func-

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tion, it is reasonable then to blame vascular risk factors as direct causes and worsening contributors of ED.[4] ED may also be the first clinical presentation of any of these comorbidities with the vascular endothelium playing a pivotal role in regulating vascular homeostasis of the corpora cavernosa. For these reasons, it might be of importance to know the prevalence and severity of ED in a population in order to extrapolate findings to better health care.

The Massachusetts Male Aging Study (MMAS), a substantial epidemiological survey quantitated the prevalence of ED in a non-institutionalized population of men. It revealed that 52% of 1,290 men aged 40 to 70 years had some degree of ED, with almost 10% exhibiting a total absence of erectile function.[5] Extrapolation of this data predicts that the worldwide incidence of ED will increase from 152 million men in 1995 to 322 million men by the year 2025.[6] Recent calculations reveal the overall incidence of ED after an average follow-up of 8.8 years to be 26 cases per 1,000 man-years.[7]

The first epidemiological survey conducted in Turkey in 1999 to determine the prevalence of ED and its associations with socio-economic, cultural factors, medical and lifestyle conditions. This population-based survey that included 1,982 men showed the age-adjusted overall prevalence of ED as 69.2% in men aged ≥40 years.[8] These findings of this study have been questioned for years for its method of using single-item self-reported question that was not universally-accepted. After improvements in assessing erectile function and its severity in recent years, a need to determine the real prevalence of ED in Turkey by using validated and universally-accepted questionnaires that assess a number of aspects of erectile function has arisen.

The goal of this cross-sectional, observational, population-based field survey was to determine the prevalence of ED and its associations in Turkish men aged ≥40 years.

Material and methods

Subjects and study design
This study was conducted as non-interventional, observational, cross-sectional field survey. A total of 2,760 subjects from seven Eurostat-NUTS Level-2 regions randomly selected among 19 provinces of the country by a proportional sampling method according to postal code lists. The subjects were recruited to be representative of the Turkish population in terms of population distribution across urban and rural settings, geographic regions, and age groups. Heterosexual men who were ≥40 years of age and who had had regular sexual intercourse within the last 6 months were included. Participants who had a cognitive disorder or who were incapable of comprehending and speaking Turkish at a level that constrained understanding, and clear and direct

answering to the questions in the study form were excluded. Before enrollment, the subjects were informed about the study and provided written informed consent. The Ethics Committee of the Ministry of Health approved the study before its initiation.

Field survey
All subject were visited in their homes by trained health care workers who understood the text of the survey and its application for interviews, and asked the patients to respond all survey questions regarding demographics, socio-economic status, socio-cultural factors, medical and sexual history, current medications, and sexual habits.

Possible determinants
The trained healthcare workers understood the text of the survey and have been trained in its application in Turkish language for clinical interviews. In order to assess various aspects of ED, the entire study participants completed nationally-validated standardized International Index of Erectile Function (IIEF) questionnaire. The IIEF questionnaire was originally a 15-item scale of male sexual function that assessed separate domains of erectile function, orgasmic function, intercourse satisfaction, orgasmic function, and overall satisfaction. However, an abridged form of the IIEF scale, IIEF-5, was used to assess erectile function for the survey. The validated IIEF-5 scale consists of five questions scored from 0 to 5 points assessing erectile function domain and one additional item for overall satisfaction scored from 1 to 5, amounting to a total score of 30. ED was classified as absent (26–30), mild (18–25), moderate (11–17), or severe (0–10).[9]

Presence of associated morbid medical conditions including diabetes mellitus, hypertension, atherosclerosis, cardiovascular and pulmonary diseases, renal insufficiency, prior pelvic surgeries, hormonal abnormalities (e.g. pituitary and thyroid hormone abnormalities, testosterone deficiency, and adrenal disorders), dyslipidemia, and other comorbidities and lifestyle factors such as smoking, alcohol consumption, and obesity were also assessed by standardized survey filled by the professionals. Body mass index (BMI) was calculated for all participants by dividing the body weight with square of the height in meters (kg/m²), and stratified as normal (<25), overweight (≥25 to 30), and obese (>30). Finally, the participants were requested to respond to a number of socio-demographic factors including overall monthly income, educational level, occupation, the geographic region, and province they were living.

After estimating the prevalence of ED in the study population, logistic regression analyses were performed to obtain independent predictors of ED such as age, comorbid medical conditions, lifestyle, and socio-demographic factors. The relation between ED and frequency of monthly sexual activity, lower urinary tract

symptoms (LUTS), ejaculatory disorders (EjD), and male pelvic dysfunction (MPD) were also evaluated. LUTS, EjD, and MPD were measured using standardized, nationally-validated questionnaires included IPSS and MSHQ–4, and IIEF–5 as well. All three validated questionnaires were combined in order to define the presence of MPD as previously described.[10]

Statistical analysis

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS Inc.; Chicago, IL, USA) version 15.0 and using Stata v9.0 program (Stata Corp., College Station, Texas, USA). The prevalence of ED is presented for the whole group and then stratified according to age groups and severity of ED. Two groups were compared using Mann–Whitney U test and multiple groups were compared using Kruskal-Wallis test for nonparametric variables. Categorical variables were compared using chi-square test and Monte-Carlo simulation. Logistic regression analysis was performed using Backward LR method in order to find independent predictors. Level of significance was accepted as a $p<0.05$.

Results

The mean age of a total of 2,760 males who completed the survey was 54.2±10.6 years. Demographic data of the study participants including age, inhabitancy, overall monthly income, occupational status, educational level, geographical region, medical history, BMI, and associated morbidities are provided in Table 1.

Overall and age-stratified prevalence of ED

Overall prevalence of ED in men aged ≥40 years was found to be 33% among entire participants of the study. When the prevalence of ED was stratified based on subjects' age, it was 17.0% in men aged in 40–49, 35.5% in 50–59, 68.8% in 60–69 age brackets, and 82.9% in men ≥70 years (Figure 1). When compared to age group of 40–49 years, the prevalence of ED increased in parallel with age ie: 2.3-fold (1.78-2.96) for 50-59, 7.6-fold (5.44-10.55) for 60-69 age brackets, and 15.5-fold (8.93-26.94) for ≥70 years (<0.001) (Table 2).

Mean IIEF scores for the whole study population was found to be 26.1. Mean IIEF scores were stratified according to age groups, and IIEF scores decreased with aging (27.9 for 40-49, 26.0 for 50-59, 23.2 for 60-69, and 17.8 for ≥70 years) (Figure 2).

Overall and age-stratified severity of ED

When study participants were stratified by severity of ED, 67% of them reported no ED, 25.6% mild, 5.5% moderate, and 1.9% severe ED. Among all men with ED, aged ≥40 years, the rate of moderate-to-severe ED was found to be 22.5%. The overall rate for moderate-to-severe ED in entire population was calculated as 7.4%. When the rate of having moderate-to-severe ED

in all study participants was stratified and calculated based on the age groups, there was a significant change according to the each decade of aging as 2.5% for 40–49, 5.8% for 50–59, 12.9% for 60–69, and 49.2% for ≥70 years, correlating with increased age (Figure 3).

Impact of socio-economic and demographic factors on ED

Impact of socio-economic and demographic characteristics of the study population on presence of ED was also analyzed statistically. When educational status of the study participants was evaluated 48.7% of them were either high school or university graduates. Analyzed data exhibited that the likelihood of having ED was significantly increased at lower educational levels ($p<0.001$). When the graduation from a university was accepted as reference, the prevalence of ED increased 1.54–fold (1.16–2.03; p=0.002) for high school, 1.8–fold (1.34–2.23; p<0.001) for elementary school graduates, and 4.34–fold (2.23–8.24; p<0.001) for illiterates ($p<0.001$).
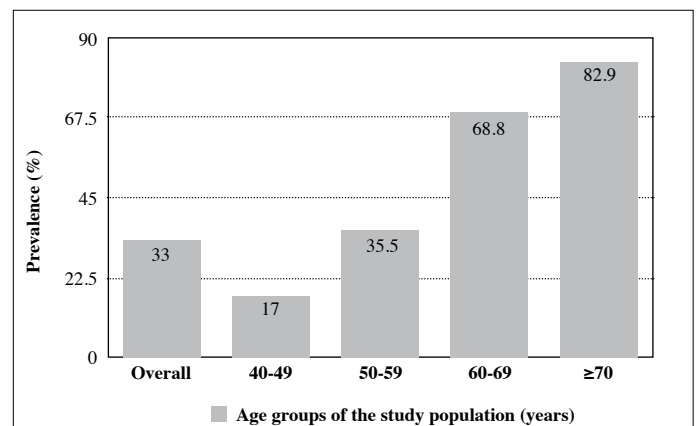

Figure 1. Overall and age-dependent prevalence of erectile dysfunction in men aged ≥40 years of age
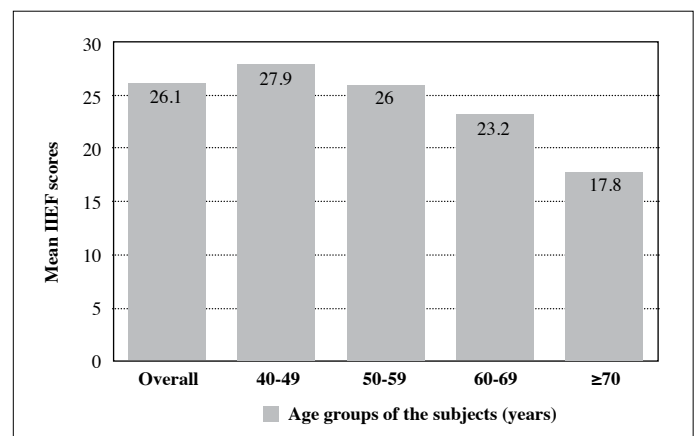
Figure 2. Overall and age-dependent mean scores of the IIEF

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Table 1. Socio-demographic characteristics and clinical features of the study population

Age, mean±SD	**54.2±10.6**
Age groups, n (%)	
40-49 years	1.080 (39.6)
50-59 years	849 (31.1)
60-69 years	490 (17.9)
≥70 years	311 (11.4)
Educational status, n (%)	
Illiterate	53 (1.9)
Literate	87 (3.2)
Elementary School	1.257 (46.2)
High School	687 (25.3)
University	636 (23.4)
Occupational status, n (%)	
Not employed	89 (3.3)
Retired	1.064 (39.1)
Employed	1.565 (57.6)
Monthly income level (1 TL=0.7 $), n (%)	
None	41 (1.5)
≤500 TL	90 (3.3)
500 TL–1000 TL	852 (31.7)
1001 TL–2000 TL	1.194 (44.4)
2001 TL–3000 TL	377 (14.0)
>3000 TL	137 (5.1)
BMI, mean±SD	27.1±4.0
BMI groups, n (%)	
Lean	12 (0.5)
Normal	719 (31.2)
Overweight	1.127 (49.0)
Obese	443 (19.3)
Medical history, n (%)	
Pelvic surgery or trauma	130 (4.9)
Spinal cord surgery or injury	65 (2.4)
Alcohol or drug abuse within the last year	157 (5.9)
Current diseases, n (%)	
Diabetes mellitus	361 (13.4)
Renal failure	53 (2.0)
Hypertension	708 (26.1)
Dyslipidemia	499 (21.9)
Cardiovascular diseases	325 (12)
Chronic obstructive pulmonary diseases	251 (9.3)
Neurological diseases	89 (3.3)
Hyperthyroidism	44 (1.6)
Hypothyroidism	14 (0.5)
Geographical regions, n (%)	
Marmara	913 (33.1)
Aegean	431 (15.6)
Central Anatolia	422 (15.3)
Black Sea	304 (11.0)
Mediterranean	348 (12.6)
East Anatolia	171 (6.2)
Southeast Anatolia	171 (6.2)

BMI: body mass index

The impact of employment on presence of ED was also evaluated. Although being employed or unemployed did not show meaningful difference regarding rates of ED (p=0.809), only 20.1% of non-ED but 50.3% of ED men reported as retired (p<0.001). Parallel to this finding, being retired was found to be an independent risk factor for having ED with 4–fold increased risk compared to active working (p<0.001).

The possibility of having ED in men living in urban areas was 1.55–fold higher than those living in rural areas (1.091–2.207; 95% C.I. for EXP, p=0.014). The impact of earnings was also
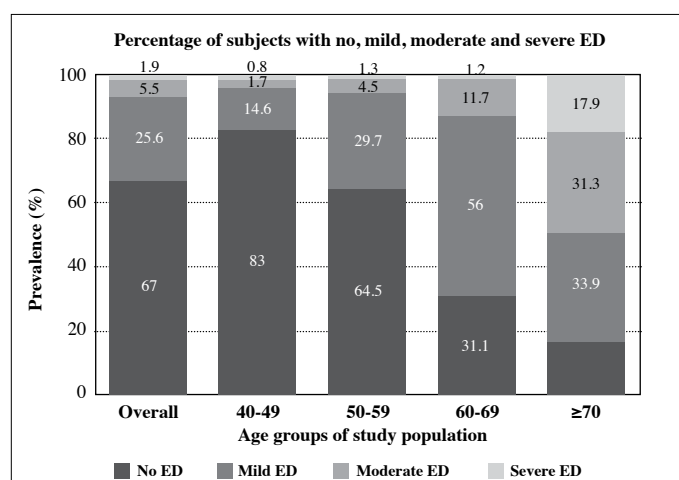

Figure 3. Overall and age-dependent rate of mild, moderate and severe erectile dysfunction according to the age stratification

Table 2. Relative risk for having ED according to age between 40 to 49 years of age

Age (years)	Level of Significance	Exp (B)	95% C.I. for Ext (B)	
			Lower	Upper
40-49	**Reference**	**1**	**Lower**	**Upper**
50-59	<0.001	2.299	1.782	2.964
60-69	<0.001	7.574	5.438	10.551
≥70	<0.001	15.509	8.929	26.937

Table 3. Comparisons of the rates of ED and No-ED in stratified BMI groups

		No ED n (%)	ED n (%)	p
BMI	Thin or Normal	386 (29.7)	200 (31.3)	0.624
	Overweight	663 (51.0)	311 (48.7)	
	Obese	251 (19.3)	128 (20.0)	

BMI: body mass index

evaluated, men with lower monthly income reported higher possibility of having ED (RR 1.56, 95% C.I. for EXP, p=0.001).

As parallel to the global incidence of obesityy, 68.3% of this study population was noted as being either overweight (49.0%) or obese (19.3%). The rates of ED in men in different BMI groups are provided in Table 3. When study population was evaluated regarding BMI levels, the number of men with and without ED did not significantly differ among normal, overweight and obese subjects (p=0.624). Regression analysis model, demonstrated that compared to men with normal BMI levels, being overweight (p=0.370) or obese (p=0.909) did not statistically significantly increase the risk for ED.

Clinical factors affecting prevalence of ED

Presence and contribution of pelvic surgery or trauma, neurologic and endocrinologic abnormalities, prostatic diseases, kidney failure, chronic obstructive pulmonary disease (COPD), and vascular risk factors including atherosclerosis, high blood pressure, dyslipidemia, coronary artery disease, heart disorders, and diabetes to ED were questioned in this survey. Vascular disorders were significantly more frequently documented in men with moderate-severe ED rather than those without or mild ED (Table 4). Chronic prostatitis (CP) or benign prostatic enlargement (BPE) was also significantly more frequently reported in men with moderate-severe ED than those without ED (p=0.031 for CP and p<0.001 for BPE). These findings showed COPD as a significant risk factor for having moderate-severe ED (p<0.001). Interestingly, the rates of neurological disorders including multiple sclerosis, prior pelvic surgery or trauma, spinal cord injury, and epilepsy were not significantly different between the moderate-severe ED and no-mild ED groups (p>0.05). The number of men who had endocrinologic disorders including pituitary, thyroid, adrenal disorders, and testosterone insufficiency were not adequate for statistical comparisons.

Predictive factors for moderate-severe ED

The impact of comorbidities on the presence of moderate-severe ED was evaluated using regression analyses and the outcomes are provided in Table 5. Diabetes mellitus was the strongest independent predictor for moderate-severe ED in men ≥40 years of age with 5–fold increased risk of ED (p<0.001). Among other independent predictive vascular risk factors, the risk of moderate-severe ED increased 4.4–fold for hypertension, 3.4–fold for atherosclerosis, 2.6–fold for coronary artery disease, and 2.1–fold for dyslipidemia (p<0.001). This study also showed that prostate disorders were independent risk factors for occurrence of moderate-severe ED, as evidenced by 3.5–fold increase in BPH (p<0.001) and 2.4–fold increase in chronic prostatitis (p=0.036).

Relation of ED with LUTS and EjD

Mean IIEF–5, IPSS and MSHQ–4 scores categorized according to age groups of the participants are provided in Table 6.

A significant correlation was documented among mean scores derived from all three questionnaires. As expected, significantly increased mean IPSS and reduced MSHQ–4 scores were associated with the presence and severity of ED (p<0.001), suggesting that ED, LUTS and EjD are age- dependent components of male pelvic dysfunction.

Erectile dysfunction and sexual activity

Frequency of sexual activity of the study participants was assessed by self-reported questionnaires based on the number of sexual activities during the previous one month (Table 7). Mean number of sexual activities in the study population was 7.3±6.3 per month. The average monthly frequency of sexual activity

Table 4. Comparisons of comorbid conditions in men with moderate-severe ED and mild-No ED

	No ED-Mild ED n (%)	Moderate-Severe ED n (%)	p
Pelvic surgery or trauma	67 (3.8)	7 (5.1)	0.469
Spinal cord surgery or injury	47 (2.7)	2 (1.4)	0.374
Diabetes mellitus	163 (9.2)	48 (33.6)	<0.001
Atherosclerosis	47 (2.6)	12 (8.5)	<0.001
Chronic prostatitis	38 (2.1)	7 (5.0)	0.031
BPH	93 (5.2)	23 (16.2)	<0.001
Chronic kidney failure	15 (0.8)	1 (0.7)	0.854
Hypertension	340 (19.1)	73 (51.0)	<0.001
Dyslipidemia	357 (20.0)	49 (34.5)	<0.001
Coronary artery disease/heart failure	143 (8.0)	27 (18.9)	<0.001
Chronic obstructive pulmonary disease	116 (6.5)	26 (18.3)	<0.001
Neurological diseases	50 (2.8)	6 (4.3)	0.325

BPH: benign prostatic hyperplasia

Table 5. Independent predictive factors for having moderate-severe ED

	Level of Significance	Exp (B)	95% C.I. for Ext (B)	
			Lower	Upper
Diabetes	<0.001	5.012	3.419	7.349
Hypertension	<0.001	4.420	3.119	6.263
BPH	<0.001	3.502	2.139	5.732
Atherosclerosis	<0.001	3.432	1.776	6.631
COPD	<0.001	3.221	2.023	5.128
Coronary artery disease	<0.001	2.666	1.696	4.191
Chronic prostatitis	0.036	2.416	1.058	5.513
Dyslipidemia	<0.001	2.102	1.459	3.027

BPH: benign prostatic hyperplasia; COPD: chronic obstructive pulmonary disease

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Table 6. Mean IPSS, IIEF–5 and MSHQ–4 scores of the study population according to the age groups

| | Age Groups (years) | | | | | |
	Overall n=2,730	40–49 n=1,080	50–59 n=849	60–69 n=490	≥70 n=311	p
IIEF–5 (mean±SD)	26.1±5.1	27.9±3.7	26.0±4.5	23.2±4.9	17.8±7.6	<0.001
IPSS (mean±SD)	4.2±5.5	2.4±3.8	4.0±5.0	5.9±6.1	8.1±7.6	<0.001
MSHQ–4 (mean±SD)	9.1±1.4	9.6±1.0	9.0±1.4	8.3±1.6	7.2±1.7	<0.001

IPSS: International Prostate Symptom Score; IIEF: International Index of Erectile Function; MSHQ-4: Male sexual health Questionnaire-4

was significantly affected by the presence and severity of ED as expressed median IIEF–5 scores (8.4 for no ED, 5.7 for mild, 3.7 for moderate, and 2.9 for severe ED) (p<0.001).

Discussion

This cross-sectional, observational, population-based field survey reported the prevalence of ED in Turkish men aged ≥40 years as 33% (25.6% mild, 5.5% moderate, and 1.9% severe ED) by using validated, multi-item questionnaires. Based on these data, it can be calculated that among all ED men aged ≥40 years, the rate of moderate-to-severe ED was 22.5%. The overall rate for moderate-to-severe ED in the entire population was calculated as 7.4 percent. This work has also confirmed that the prevalence and severity of ED was significantly correlated with age as reported by previous studies worldwide. Last but not the least, our data suggested that, apart from age, vascular risk factors and prostate disorders were the independent predictors of ED.

Previously, Turkish Erectile Dysfunction Study Group carried out a study in 1999 and published in 2003 that age-adjusted overall prevalence of ED in Turkish men ≥40 years of age were 69.2% (including mild, moderate and severe ED) by using single-item question.[8] Erectile functions of all the participants in that study were assessed with single question that also used in the Pfizer Cross-national Study of Erectile Dysfunction as "How would you describe yourself?" and the categorical responses were considered as "no ED," "mild (minimal) ED," "moderate ED," and "severe ED".[8] Cross-national study of the prevalence and correlates of ED conducted between 1997–1998 and reported in 2003 by Nicolosi et al utilized the same single-item question in order to assess the presence and severity of ED in men aged between 40–70 from 4 countries and reported the age-standardized prevalence of ED as between 42% and 78% in Brazil, Japan, Italy, and Malaysia.[11]

A systematic review conducted on prevalence of ED in general population evaluated 23 published studies from all over the world based on 12-item criteria and reported that only a few of them have fulfilled the criteria of required methodological quality.[12] Abovementioned two studies that used the same single-

Table 7. Sexual activities per month according to age and severity of erectile dysfunction

	Number of sexual activities per month	p
Overall	7.3±6.3	
IIEF–5		
None	8.4±6.0	
Mild	5.7±6.8	<0.001*
Moderate	3.7±4.8	
Severe	2.9±2.9	

*Kruskal-Wallis

item question reported the prevalence of ED which led to an overestimation relative to others as their evaluation of ED was based on one question. Our current study has taken all of the mistakes made by previous works into consideration, and used all methodological criteria defined by Prins et al.[12] Our study also included all external and internal validity and informativity checklists and found the actual prevalence of ED as 33% in Turkish men ≥40 years of age by using nationally-validated and universally-accepted IIEF questionnaires.

ED has been considered as age-dependent phenomenon due to increased rates of comorbidities and enhanced severity. Previous well-conducted epidemiological surveys have also focused on age-dependency of ED. Two of the Asian studies showed doubling of the prevalence rate at age 60-70 with almost another doubling at age 70-79 years.[13,14] The more recent Korean report stratified by age showed a tripling of the prevalence for the 60-69 age group compared to those younger whether self-reported or scored by the IIEF.[15] Another recent report from western Australia had an older age range in their study and reported an overall prevalence rate of 40.3%, almost 4 times the prevalence from the other age-stratified study with an overall ED rate of 10percent.[16] Our study found similar results regarding age-dependency of ED by showing the higher rates of ED in 60-69 (68.8%) and ≥70 (82.9%) compared to those in 40-49 (17%) and 50-59 (35.5%) years of age. When compared to the age of 40s, the relative risk was increased 3-fold in 50s, 7.5-folds in 60s and 15.5 fold in 70s and older.

Depending on the underlying vascular risk factors as well as age, an increased severity of ED can be expected. The widely-cited MMAS study showed that 52% of men aged 40–70 years had some degree of ED. Moderate-to-complete ED was encountered in 34.8% of men, which was strongly related to age and associated with a number of major medical conditions.[5] This rate for ED was confirmed by Rosen et al.[17] data derived from the multinational MSAM-7 survey that reported 48.7% of men had erection difficulty and 10% of men had complete absence of erection based on responses to DAN-PSS questionnaire. Our study reported prevalence of ED as 33% in men aged ≥40 years, of those 25.6% had mild, 5.5% moderate, and 1.9% severe ED. Among all men with ED aged ≥40 years, the rate of moderate-to-severe ED was found to be 22.5% in our study. The overall rate for moderate-to-severe ED in entire population was calculated as 7.4%. When the rate of having moderate-to-severe ED in all study participants was stratified and calculated based on the age groups, there was a significant change according to the each decade of aging as 2.5% for 40–49, 5.8% for 50–59, 12.9% for 60–69, and 49.2% for ≥70 years, demonstrating age-dependency for the severity of ED.

The main cause of ED is organic in nature, with vascular etiologies being the most common risk factors. The incidence of ED increases with the number of vascular comorbidities such as hypertension, diabetes mellitus, ischemic heath disease, dyslipidemia, and atherosclerosis. The earliest signal of endothelial damage in men with vascular risk factors is the manifestation of ED. As the penis is a barometer of the body's endothelial function, it is reasonable then to blame vascular pathologies, as direct causes of ED.[2] ED may be the first clinical presentation of any of these comorbidities with the vascular endothelium playing a pivotal role in regulating vascular homeostasis of the corpora cavernosa. Previous works demonstrated that the presence and number of associated vascular risk factors were correlated with the severity of penile vascular abnormalities evidenced by penile Doppler duplex ultrasound evaluation.[4] In our current work, we also assessed the impact of co-morbidities on the presence and severity of ED.

According to the multimodal regression analyses, we found significantly higher rates of moderate-severe ED in men with comorbid vascular risk factors compared to men with no-ED or mild-ED. The RR for having moderate-severe ED compared to no-ED and mild-ED was found 5-fold in diabetes, 4.4-fold in hypertension, 3.4-fold in atherosclerosis, 2.6-fold in coronary artery disease, and 2.1-fold in dyslipidemia. Considering its multifactorial deleterious affect on penile erection, diabetes has been considered as the strongest underlying risk factor for ED. In our study population, 9.2% of the subjects with no ED-mild ED reported diabetes in contrast to 33.6% of the cases with moderate-severe ED. Not only the higher prevalence of ED in

diabetic subjects, but also the severity of ED was significantly higher in diabetic men. Another important comorbidity, high blood pressure was seen 19.1% of no ED-mild ED cases, but the rate was 51% in moderate-severe ED cases, demonstrating the strong relationship between severity of ED and hypertension. Other vascular risk factors including dyslipidemia, atherosclerosis and coronary artery disease were significantly correlated with the prevalence and severity of ED in men agyed ≥40 years.

Epidemiological surveys using internationally-validated symptom scales, such as IPSS, have reported an overall rate of LUTS as >50% in men >50 years of age.[18-20] The MSAM-7 study by including a total of 14,000 male aged 50–80 years has reported prevalence of moderate-severe LUTS as 31% (34.2% for Europe and 29% for the US).[17] Due to common pathophysiological links, LUTS suggestive of BPH and ED have been shown to have strong relationships evidenced by epidemiological surveys.[10] The current study reported that three out of four men aged ≥40 years exhibited some degree of LUTS, of which only 16.3% was moderate-to-severe. When this association was evaluated, our study has been presenting further statistically meaningful support to the link between ED and prostatic diseases including chronic prostatitis and BPH. Based on the regression analyses of the study population, it can be postulated that chronic prostatitis had 2.4-fold and BPH had 3.5-fold increased risk of having moderate-severe ED in men ≥40 years of age.

Sexual activity is considered as an integral part of men's health and their quality of life. As a part of ageing and deterioration of sexual functions, the number and quality of erection can be expected to reduce. Mean monthly sexual activity was also assessed in this study and found to be 8.4 in men without ED. Compared to the men with no ED or mild ED, mean monthly sexual activity was found to be significantly reduced in men with moderate (3.7) and severe (2.9) ED. These data would further support practicing physicians to focus on treating males' sexual dysfunctions in order improve their overall health and quality of life.

The limitation of this study was the age of the study population. In order to reflect to the criteria for a population-based survey, relatively younger men had to be included into the study for representing the nations' age, as seen in the 40–49 year-old group that consisted of 40% of the participants. Due to this age distribution, the prevalence of ED found in this population-based survey might be different from previously published international large-population surveys including the MSAM-7 and MMAS outcomes. We believe that this age distribution needs to be taken into account when evaluating outcomes of this survey.

In conclusion, this population-based survey in Turkish men of ≥40 years of age reported the prevalence of ED as 33 percent.

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Furthermore, this study reported age as the main predictor for presence and severity of ED. As parallel to the previous epidemiological reports, this work have provided further support to the contribution of vascular risk factors and a number of lifestyle issues on ED. We believe that a greater understanding on the epidemiological surveys of the prevalence of ED and its associations will help clinicians to look outside our specialty for strategies to improve male sexual function in order to improve their quality of life. It is crucial to take a more global approach to management of ED, one that focuses not only on chronic diseases, but also men's sexual quality of life.

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